

REMARKS

Claim 12 was rejected under 35 U.S.C. 112, second paragraph. Claims 1 {SIC: 6], 12 and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3,804,710) in view of Applicant's purported admission. Claims 7 and 8 were rejected under the rejection as applied to claim 6, and further in view of Clapham (U.S. 4,046,631). Claim 9 was rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3, 804, 710), as applied to claim 6, in view of Ocken (U.S. 4,120,752). Claim 10 was rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3,804,710), as applied to claim 6, in view of Hayashi et al. (U.S. 4,111,748). Claim 11 was rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3, 804, 710) in view of Ocken (U.S. 4,120,752).

Reconsideration of the application based on the following remarks is respectfully requested.

35 U.S.C. §112 Rejection

Claim 12 was rejected under 35 U.S.C. §112, second paragraph as omitting essential steps.

Claim 12 recites a method for manufacturing the fuel rod as recited in claim 6 comprising:

determining the volume of the second intermediate portion as a function of expansion of gases in the fuel rod during operation.

It is respectfully submitted that claim 12 recites manufacturing a full and complete structural device, that of claim 6. Nothing essential is omitted by thereafter including a single method step, and the dependency on claim 6 eliminates any incompleteness.. One of skill in the art clearly would understand the metes and bounds of the claim, which are definite by virtue of the dependency.

Withdrawal of the rejection is respectfully requested.

35 U.S.C. §103 Rejections

Claims 1 [SIC: 6], 12 and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3,804,710) in view of Applicant's purported admission. Bresnick discloses a nuclear reactor fuel element comprising "a tubular cladding member or

tube 1, of the desired diameter and length. Within this tube are placed fuel pellets 2 which fill the tube from the bottom end up to a distance from the top end sufficient to provide a fission gas receiving chamber 3 of the required dimension.” (Col. 2, lines 17 to 22).

According to claim 6 the annular space is “an annular space for expansion of gas...formed between the outer surface of the second portion of the inner portion of the lower plug and the inner surface of the cladding,” the second portion being between the first and third portions in the axial direction as claimed. Claim 6 also recites, “a volume of the annular space being a function of expansion of gas in the fuel rod during operation.”

As admitted by the Office Action, Bresnick fails to teach or show “a volume of the annular space being a function of expansion of gas in the fuel rod during operation,” as recited in claim 6.

The present specification at Page 3, line 7 states that “A conventional method for increasing volume for the expansion of gases inside MOX fuel rods involves interposing, *between the upper surface of the lower plug inside the cladding and the first lower end of the column of fuel pellets*, a cross-member or shim of stainless steel or zirconium alloy which is constituted by a tube that has a thick wall.” (Emphasis added) Such a tube is shown for example as tubular shim 9 in Fig. 1(b).

The purported admission in the specification if anything teaches away from modifying the space of the Bresnick, as it teaches that it would have been conventional to put a shim on top of the surface 15 of Bresnick. There is absolutely no teaching or admission to modify the space below the surface 15 of Bresnick, and it is respectfully submitted that, on a fair reading of the purported admission, that such a modification would solely be based on hindsight reasoning.

Withdrawal of the rejections of claim 6 and its dependent claims 12 and 13 under 35 U.S.C. §103 are respectfully requested.

With further respect to claim 12, the proper standard is if the purported prior art combination would show such a step, and it is respectfully submitted that it does not.

Claims 7 an 8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3,804,710), as applied to claim 6, in view of Clapham (U.S. 4,046,631).

Bresnick is discussed above.

Clapham discloses a "metal nuclear fuel can provided with a metal closure plug for closing an open end of the can, the plug having a closure portion dimensioned to engage the open end, a stem of reduced cross-sectional area extending axially from the dimensioned portion into the can interior, the stem terminating in a flange of enlarged cross-section formed of a material which is selectively susceptible of attack by hydrogen." (Col. 1, lines 46 to 54).

In light of the discussion above, withdrawal of the rejections of claims 7 and 8 is respectfully requested.

With further regard to claim 7, claim 7 recites, "wherein the third cylindrical portion of the inner portion of the lower plug of the fuel rod has a diameter such that there remains, between the outer lateral surface of the third cylindrical portion and the inner surface of the tubular cladding, a radial clearance for assembly and passage of gas of between one and two tenths of a millimeter."

Both Bresnick and Clapham fail to teach or show "a radial clearance for assembly and passage of gas of between one and two tenths of a millimeter," as recited in claim 7. It is again respectfully submitted that it would not have been obvious to modify Bresnick in view of Clapham, nor would routine experimentation by one of skill in the art have come up with the limitation set in claim 7, as one of skill in the art would not have determined that the clearance size would be a result effective variable.

With further regard to claim 8, claim 8 recites "wherein the second cylindrical portion of the inner portion of the lower plug has a diameter of between 40% and 60% of the inner diameter of the tubular cladding and a length in the axial direction of between 8 and 10 times the inner diameter of the tubular cladding."

Both Bresnick and Clapham fail to teach or show "the second cylindrical portion of the inner portion of the lower plug has a diameter of between 40% and 60% of the inner diameter of the tubular cladding," as recited in claim 8. It is again respectfully submitted that it would not have been obvious to one of skill in the art to modify Bresnick in view of Clapham, nor would routine experimentation by one of skill in the art have come up with the limitation set in claim 8. One of skill in the art would not have determined that the proportions of the lower plug diameter and inner diameter of the cladding would be a result effective variable. Furthermore, the length "of between 8 and 10 times the inner diameter of the tubular cladding," is not mere design but a important feature of the invention. This

defines the air space of the annular space.

Withdrawal of the rejection of claims 7 and 8 for these reasons as well is respectfully requested.

Claim 9 was rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3,804,710), as applied to claim 6, in view of Ocken (U.S. 4,120,752).

Bresnick is discussed above.

Ocken discloses a fuel pellet comprised of an inner cylindrical part provided with a mixture of uranium oxide and plutonium oxide, and an outer annular part integral with the inner part and containing uranium oxide free of plutonium oxide.” (See Abstract).

In light of the discussion above regarding independent claim 6, withdrawal of the rejection is respectfully requested.

Furthermore, in regard to claim 9, claim 9 recites “wherein at least a portion of the fuel pellets of the column of fuel pellets comprises one of plutonium oxide and a mixed oxide of uranium and plutonium.”

Bresnick fails to teach or show use of “a portion of the fuel pellets of the column of fuel pellets comprises one of plutonium oxide and a mixed oxide of uranium and plutonium,” as recited in claim 9. It is again respectfully submitted that it would not have been obvious to one of skill in the art to modify Bresnick in view of Ocken as Bresnick is not designed to have expansion space or gas capabilities for use with MOX.

The Office Action does not address this contention. The response is arguing that one of skill in the art of nuclear fuel rod design would know that Bresnick is not suitable for MOX fuel since it is not designed to have expansion space or gas capabilities for use with MOX pellets, and would not have looked to Ocken or any other MOX reference to use with the Bresnick.

Withdrawal of the rejection of claim 9 for these reasons as well is respectfully requested.

Claim 10 was rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3,804,710), as applied to claim 6, in view of Hayashi et al. (U.S. 4,111,748).

Bresnick is discussed above.

Hayashi et al. discloses

In light of the discussion above regarding independent claim 6, withdrawal of the rejection is respectfully requested.

Furthermore, in regard to claim 10, claim 10 recites “at least one cross-member in at least one zone of the second cylindrical portion, extending in an axial direction, the at least one cross-member constituted by a diametrically widened cylindrical portion of the second cylindrical portion that has an outer diameter that is substantially equal to the inner diameter of the tubular cladding that is reduced by an assembly clearance.”

Both Bresnick and Hayashi fail to teach or show “at least one cross-member in at least one zone of the second cylindrical portion, extending in an axial direction, the at least one cross-member constituted by a diametrically widened cylindrical portion of the second cylindrical portion that has an outer diameter that is substantially equal to the inner diameter of the tubular cladding that is reduced by an assembly clearance,” as recited in claim 10. The Office Action asserts cylindrical body 6e is the cross member. However, Hayashi discloses a support for the fuel pellets in the fuel rod, which is similar to the third portion in the present invention. The purpose of cross member 17 is to allow gas to pass through, prevent scorching of the cladding and guides the central part of the plug inside the cladding. (Specification page 11, lines 28 to 31). It would not have been obvious to one of skill in the art to modify Bresnick in view of Hayashi. Furthermore there is no motivation to do so.

Withdrawal of the rejection of claim 10 for these reasons as well is respectfully requested.

Claim 11 was rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3, 804, 710) in view of Ocken (U.S. 4,120,752).

Bresnick is discussed above, as is Ocken.

Claim 11 recites a fuel rod for a nuclear reactor that is cooled by water, comprising:
a cylindrical tubular cladding;
a column of nuclear fuel pellets that are stacked one on top of another inside the tubular cladding in the axial direction of the cladding;
a first plug for tight closure of a first axial end of the cladding of the rod arranged at a lower portion of the fuel rod when the rod is in an operating position inside the nuclear

reactor, the cladding of the rod having an axis vertical; and

a second plug for tight closure of the second axial end of the cladding, the column of fuel pellets resting on an inner portion of the first plug, referred to as a lower plug, via a first lower end, and being retained inside the tubular cladding by a compression spring that is interposed between a second upper axial end of the column of fuel pellets and an end of an inner portion of the second plug, referred to as the upper plug, wherein the inner portion of the lower plug engaged inside the tubular cladding successively comprises, in the axial direction and in a direction from the first towards the second end of the cladding, a first cylindrical portion that has a diameter that is substantially equal to the inner diameter of the tubular cladding, a second cylindrical portion that has a diameter that is smaller than the inner diameter of the tubular cladding and a third cylindrical portion that has a diameter that is smaller than the inner diameter of the tubular cladding and that is greater than the diameter of the second cylindrical portion so that there remains, between a lateral outer surface of the third cylindrical portion and an inner surface of the tubular cladding, a radial clearance for passage of gas and a substantially planar end surface on which the first end of the column of fuel pellets rests, so that an annular space for expansion of gas is formed between the outer surface of the second portion of the inner portion of the lower plug and the inner surface of the cladding,

wherein at least a portion of the fuel pellets of the column of fuel pellets comprises one of plutonium oxide and a mixed oxide of uranium and plutonium.

Bresnick, as admitted, fails to teach or show use of "a portion of the fuel pellets of the column of fuel pellets comprises one of plutonium oxide and a mixed oxide of uranium and plutonium," as recited in claim 9. It is again respectfully submitted that it would not have been obvious to one of skill in the art to modify Bresnick in view of Ocken as Bresnick is not designed to have expansion space or gas capabilities for use with MOX. One of skill in the art would have not have looked to the MOX fuels of Ocken for use in Bresnick, as it would have been understood that Bresnick was unsuitable for MOX fuels, as discussed above with respect to claim 9.

CONCLUSION

It is respectfully submitted that the application is in condition for allowance and applicants respectfully request such action.

If any additional fees are deemed to be due at this time, the Assistant Commissioner is authorized to charge payment of the same to Deposit Account No. 50-0552.

Respectfully submitted,

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